Pain Management Nursing 20 (2019) 599–603

Contents lists available at ScienceDirect

Pain Management Nursing

journal homepage: www.painmanagementnursing.org

Impact of Different Illness Perceptions and Emotions Associated with Chronic Back Pain on Anxiety and Depression in Patients Qualified for Surgery

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ARTICLE INFO

Article history:
Received 8 June 2018
Received in revised form
22 November 2018
Accepted 23 February 2019

ABSTRACT

Background: Anxiety and depression are known comorbidities of chronic back pain. Their psychological predictors are not well established in patients with chronic back pain qualified for neurosurgery.
Aims: The purpose of this study was to determine the psychological predictors of depression and anxiety in patients with chronic back pain qualified for surgery.
Design: This was a cross-sectional study.
Settings: A neurosurgical ward in Gdańsk, Poland.
Participants/Subjects: All patients who were admitted to the neurosurgical ward and met the inclusion criteria were recruited for the study. Finally, 83 patients with chronic back pain waiting for surgery were recruited.
Methods: A battery of questionnaires, including Illness Perceptions Questionnaire–Revised, Multidimensional Health Locus of Control Scale, Hospital Anxiety and Depression Scale, and Brief Pain Inventory, was used in 83 spinal surgery candidates.
Results: Higher anxiety was predicted by stronger beliefs about negative consequences of illness ($\beta = .205$, $p < .05$), worse illness coherence ($\beta = .204$, $p < .05$), negative emotional representations of illness ($\beta = .216$, $p < .05$), and depression ($\beta = .686$, $p < .001$). Higher depression was predicted by anxiety ($\beta = .601$, $p < .001$), pain interference ($\beta = .323$, $p < .01$), lower personal control over pain ($\beta = -.160$, $p < .05$), and lower external control of health ($\beta = -.161$, $p < .05$) but, surprisingly, higher internal control of health ($\beta = .208$, $p < .01$).
Conclusions: Anxiety and depression commonly coexist in chronic back pain sufferers qualified for spine surgery but are derived from dissimilar beliefs. The results highlight the usefulness of advising about the disease and treatment in comprehensive care for this group of patients.

Within the interdisciplinary treatment of chronic back pain, surgery is an option for patients who do not benefit from conservative therapy (Wang, Guo, Lu, & Ni, 2016). Because psychosocial factors such as negative interpretation of pain, anxiety, and symptoms of depression have been proven to be important outcome predictors of chronic pain therapies, particularly spinal surgery, current preoperative workup includes psychological assessment aimed at identifying risk factors of poor treatment effects (Blackburn et al., 2016; Lindbäck, Tropp, Enthoven, Abbott, & Öberg, 2016). However, in the future, rather than deciding on an indication for surgery based on psychosocial risk factors, preoperative psychological care should focus on treatment aimed at optimizing outcomes. Thus there is an urgent

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https://doi.org/10.1016/j.pmn.2019.02.009
1524-9042/

need to analyze psychosocial determinants of chronic back pain in surgical candidates to identify optimal strategies to modify these factors early and thus improve surgical outcome (George & Beneciuk, 2015; Louw, Puentedura, Diener, & Peoples, 2015).

Within the psychological factors contributing to the occurrence of chronic back pain, an important role is played by patients' beliefs about perceived pain (Adams, 2006; Nicholls, Hill, & Foster, 2013; Heyduck, Meffert, & Glattacker, 2014; Sanzarello et al., 2016; Setchell et al., 2017) and patients' anxiety (Altug et al., 2016; Farin, 2015), often related to depression (Kayhan, Albayrak Gezer, Kayhan, Kitiş, & Gölen, 2016) and distress (Waters et al., 2016). Moreover, depressive symptoms, depressive mood, distress, and anxiety affect the perception of chronic back pain and disability (Seekatz, Meng, Bengel, & Faller, 2016).

One of the factors contributing to pain persistence is the presence of anxiety, depression, and pain, mutually reinforcing each other. This biopsychosocial approach is the basis of the fear-avoidance model (Crombez, Eccleston, Van Damme, Vlaeyen, & Karoly, 2012; Vlaeyen, Crombez, & Linton, 2016). The deciding factor for pain persistence in this model is the person's interpretation of pain. If the pain is interpreted as a sign of a serious injury or pathologic condition, the individual's control over pain is minimal or none. This leads to a catastrophic interpretation of pain, fear, and avoidance of daily activities because the person is convinced that they will lead to pain (so-called disuse syndrome). As a consequence of interplay among the patient's convictions, emotions, and behavior, the pain threshold may be lowered and depressive mood and lack of physical fitness may lead to pain persistence and disability (Katz, Rosenbloom, & Fashler, 2015). Anxiety and depression may lead to increased risk of suicide in chronic pain patients. Moderate or severe depression, increased pain intensity, poor sleep quality, social isolation, deterioration in function, hopelessness, and catastrophizing are among the warning signs of increased suicide risk (Cheatle, 2014).

Exploring the role of depression and anxiety in patients qualified for neurologic surgery has great practical value. The interventions that have been implemented primarily aim at improving mood and reducing preoperative anxiety (Shamji, Rodriguez, Shcharinsky, & Paul, 2016). There are only single reports on the presence of anxiety and depression in chronic back pain sufferers referring to any theoretical basis that would point at some contribution of beliefs, emotions, and behaviors in experiencing chronic pain (Adams, 2006; Nicholls, Hill, & Foster 2013; Heyduck et al., 2014) Because a theory-based approach allows for better understanding of psychological processes that affect perception of chronic pain and chronic back pain treatment, Leventhal's theoretical model based on the self-regulation theory (Leventhal, Meyer, & Nerenz, 1980) has been recognized as particularly useful for the study of relationships between illness perceptions and emotions on pain, depression, anxiety, and associated behaviors (Løchting, Garratt, Storheim, Werner, & Grotle, 2017). In Leventhal's model an assumption is made that the symptom acts as a stimulus and the experienced symptoms affect patients' emotional and cognitive processes.

A meta-analysis of studies on the relationships between disease perception and disease-related behavior (Hagger & Orbell, 2003) has found that perceptions of a disease as severe or uncontrolled are positively correlated with the use of avoidance strategies and emotional expression, whereas perceiving a disease as controllable correlated strongly with patients' preferences for problem-solving strategies. Research has indicated that a better understanding of somatic symptoms modified the symptoms' perception (Heyduck et al., 2014). To our knowledge, no studies on cognitive and emotional determinants of anxiety and depression using Leventhal's model have been performed in spinal surgery candidates with chronic back pain.

The aim of this study is to analyze the psychological predictors of depression and anxiety in patients with chronic back pain who are qualified for surgery.

The following variables were measured:

- Illness perceptions based on Leventhal's model
- Patients' health locus of control
- Anxiety and depression levels
- Experienced pain intensity and interference
- Sociodemographic variables (including gender and age)

Material and Methods

Participants

A total of 83 patients with chronic back pain waiting for surgery in a neurosurgical ward were recruited for the study in 2016. Exclusion criteria were presence of psychiatric treatment, psychiatric history, and opioid use. Informed consent was obtained. The patients were treated for cervical spondylotic radiculopathy and myelopathy (21.7%), degenerative disc herniation (24.1%), foraminal stenosis (14.5%), segmental lumbar spinal instability (18.1%), lumbar spinal stenosis (9.6%), and vertebral osteoporotic fracture (12.0%). The group suffering from osteoporotic fractures had back pain lasting more than 3 months, thereby qualifying as chronic pain. Surgical treatment was indicated for patients who had significant radicular pain at least 6 weeks after an adequate course of conservative management and patients who had a positive straight leg raise test, a severe or progressive motor or sensory deficit, and other signs of root dysfunction. The clinical condition of the patient had to be adequate to the changes identified in the spine and on computed tomography scans. The sociodemographic information on age, gender, employment status, and pain duration was gathered using a questionnaire. The clinical and sociodemographic characteristics of the studied group are presented in Table 1.

Methods

In our study the Revised Illness Perception Questionnaire (IPQ-R), based on Leventhal's model and widely applied in medical science and psychology, was employed as a valid and reliable tool

Table 1
Clinical and Sociodemographic Characteristics of the Studied Group

Variable	Value (%)
Age; M (SD)	51.02 (14.7)
Gender; n (%)	
Female	50 (60.2)
Male	33 (39.8)
Employment; n (%)	
Yes	49 (59.0)
No	34 (41.0)
Pain intensity (11-point NRS); M (SD)	4.95 (2.08)
Pain duration in months; M (SD)	51.52 (73.32)
Diagnosis; n (%)	
Cervical spondylotic radiculopathy and myelopathy	18 (21.7)
Degenerative disc herniation	20 (24.1)
Foraminal stenosis	12 (14.5)
Segmental lumbar spinal instability	15 (18.1)
Lumbar spinal stenosis	8 (9.6)
Vertebral osteoporotic fracture	10 (12.0)
Spine level; n (%)	
Cervical	18 (21.7)
Lumbar	65 (78.3)

M = mean; SD = standard deviation; NRS = Numeric Rating Scale.

(Hagger & Orbell, 2003). The IPQ-R (Moss-Morris, Weinman, & Petrie, 2002) and its predecessor, the Illness Perception Questionnaire, were both developed as modules of Leventhal's Common-Sense Model of Illness (CSM). Modules based on CSM were adapted for the clinical picture of chronic pain and other diseases (Leventhal, Phillips, & Burns, 2016). In the present study we used a module specifically designed for chronic pain patients. The dimensions of Leventhal's model are the *identity*, *cause*, *timeline*, *consequences*, and *controllability* of symptoms. The *identity* dimension is formed of beliefs about naming the experienced symptoms. *Cause* reflects factors responsible for experienced pain, which can be of a biological, psychological, behavioral, or environmental nature. *Timeline* comprises beliefs about the existence and progress of pain, such as, "The pain is persistent." The *consequences* dimension is made of beliefs reflecting the role of chronic pain in overall quality of life or the impact of pain on everyday functioning. *Controllability* refers to patients' beliefs concerning their own or their physicians' ability to cure or alleviate pain, where patients assess the effectiveness of strategies that were supposed to influence treatment and general functioning. Within the *controllability* dimension, *personal* and *treatment* components are distinguished. *Personal control* reflects patients' ability to control the ailments of treatment; *treatment control* encompasses the beliefs about the treatment's effectiveness. In recent research the contribution of emotions to the experienced pain (or other disorders) and to evaluating one's own health and functioning is also assessed (Leventhal et al., 2016; Rozema, Völlink, & Lechner, 2009). Reliability and validity were assessed using data from this sample. Reliability estimated using Cronbach's α was moderate and ranged from .70 (for *timeline*) to .59 (for *treatment control*). *Personal control* had a low Cronbach's α of .42. Validity was assessed by correlating the results with the results of the Hospital Anxiety and Depression Scale (HADS) and Multidimensional Health Locus of Control Scale (MHLC). The correlation coefficients were satisfactory. Validity was also assessed using principal components analysis. Six factors emerged, reflecting roughly the factor structure of the original IPQ-R. Eigenvalues ranged from 4.30 in factor 1 to 2.20 in factor 6.

The MHLC is based on a multidimensional approach to the patient's conceptualization of health locus of control, where the beliefs about other people's influence and the role of coincidence in life are separate dimensions (Levenson & Miller, 1976). The MHLC questionnaire serves as a tool measuring health control loci in three dimensions: (1) internal, a conviction that one has one's own health under control; (2) external, a sense that somebody's health is a result of other people's actions (especially the medical staff); (3) chance, a belief that health is determined by fate or external factors. The MHLC tool consists of 18 items rated on a six-level Likert scale. The MHLC has been adapted into Polish. Reliability based on Cronbach's α was .74 for internal, .69 for chance, and .54 for external. Theoretical validity was estimated by correlating the results of the MHLC with other measures (e.g., self-esteem, health valuation) (Juczyński, 2012).

HADS is commonly used for assessing anxiety (tension, nervousness) and an exacerbation of depressive symptoms (loss of joy, lowered mood, sadness, loss of interests) (Snaith & Zigmond, 1986). HADS is a tool used both in scientific research and in clinical practice as a screening method for patients requiring further diagnosis. Cronbach's α for HADS was between .77 and .85 for the subscales. Validity was assessed by correlating the results with emotional and social functioning from the European Organization for Research and Treatment of Cancer QLQ-C30 scale (de Walden-Gałuszko & Majkowicz, 2000). This tool is recommended for use in modern research (Snaith, 2003), as well as in neurosurgical patients (Rapp et al., 2018).

The Brief Pain Inventory (BPI) allows for measuring pain severity and pain interference (Cleeland & Ryan, 1994); it also allows a determination of type of pain, a precise pain location, and the appropriate actions to relieve pain. High Cronbach's α values (between .86 and .99) point to high reliability. High correlations were reported between the results of the Polish version of BPI and other pain scales (Leppert & Majkowicz, 2010).

Linear regression analysis was used to determine the predictors of depression and anxiety in the studied group. Psychological variables (from IPQ-R, MHLC, and HADS) as well as pain ratings (BPI) and sociodemographic and clinical data were included in the models. Depression was included as a possible predictor of anxiety. Similarly, anxiety was included as a possible predictor of depression. All statistical analyses were performed in STATISTICA 12 (StatSoft, Inc., Tulsa, OK, USA).

Results

The model of predictors of anxiety was statistically significant, and the proposed predictors explained 57% of the variance of anxiety in the studied group (adjusted $R^2 = 0.574$, $p < .001$). As illustrated in Table 2, higher anxiety was predicted by stronger beliefs about negative consequences of illness ($\beta = .205$, $p < .05$), lower illness coherence ($\beta = .204$, $p < .05$), and negative emotional representations of illness ($\beta = .216$, $p < .05$). Anxiety was also strongly predicted by depression ($\beta = .686$, $p < .001$). Timeline, personal control, treatment control, and health control (internal and external, as well as chance) were nonsignificant predictors. Furthermore, anxiety was not predicted by pain severity, pain interference, gender, age, employment status, or spine level.

The model of predictors of depression was also statistically significant (Table 3). Almost 63% of variance of depression was explained by the studied variables (adjusted $R^2 = 0.627$, $p < .001$). The main predictors of depression in the studied group were anxiety ($\beta = .601$, $p < .001$) and pain interference ($\beta = .323$, $p < .01$). Higher depression was also associated with lower personal control over pain ($\beta = -.160$, $p < .05$) and lower external control of health ($\beta = -.161$, $p < .05$) but, surprisingly, higher internal control ($\beta = .208$, $p < .01$). Timeline, cyclical timeline, consequences, treatment control, illness coherence, and emotional representations

Table 2
Linear Regression Analysis, Dependent Variable—Anxiety (Adjusted $R^2 = 0.574$, $p < .001$, N = 83)

Method	Variable	Standardized β	*p*
IPQ-R	Timeline	−.059	.492
	Timeline cyclical	−.136	.149
	Consequences	.205	.037*
	Personal control	.101	.243
	Treatment control	−.125	.182
	Illness coherence	.204	.031*
	Emotional representations	.216	.018*
MHLC	Health control, internal	−.137	.105
	Health control, external	.088	.320
	Health control, chance	.133	.117
BPI	Pain severity	−.024	.839
	Pain interference	−.023	.861
HADS	Depression	.686	.000†
Socio-demographic	Gender (1, male; 0, female)	.147	.067
	Employment (1, yes; 0, no)	−.004	.961
	Spine level	.024	.781
	Age	−.155	.084

IPQ-R = Revised Illness Perception Questionnaire; MHLC = Multidimensional Health Locus of Control; BPI = Brief Pain Inventory; HADS = Hospital Anxiety and Depression Scale.
* $p < .05$.
† $p < .001$.

Table 3
Linear Regression Analysis, Dependent Variable—Depression (Adjusted $R^2 = 0.627$, $p < .001$, N = 83)

Method	Variable	Standardized β	*p*
IPQ-R	Timeline	.084	.296
	Timeline cyclical	.137	.119
	Consequences	−.083	.370
	Personal control	−.160	.046*
	Treatment control	.030	.736
	Illness coherence	−.167	.060
	Emotional representations	−.045	.603
MHLC	Health control, internal	.208	.008†
	Health control, external	−.161	.049*
	Health control, chance	−.028	.726
BPI	Pain severity	−.097	.374
	Pain interference	.323	.008†
HADS	Anxiety	.601	.000‡
Sociodemographic	Gender (1, male; 0, female)	−.142	.058
	Employment (1, yes; 0, no)	−.006	.939
	Spine level	−.055	.485
	Age	.127	.130

IPQ-R = Revised Illness Perception Questionnaire; MHLC = Multidimensional Health Locus of Control; BPI = Brief Pain Inventory; HADS = Hospital Anxiety and Depression Scale.
* $p < .05$.
† $p < .01$.
‡ $p < .001$.

were nonsignificant predictors. Additionally, pain severity, gender, age, employment status, and spine level were also nonsignificant predictors of depression.

Discussion

Our study found that anxiety and depression in patients with chronic back pain waiting for surgical spine treatment coexisted and constituted an integral part of the clinical picture. The results of our study illustrate a predictive character of patients' beliefs about chronic back pain and emotions associated with it. Anxiety was predicted by the beliefs about negative consequences of pain and low coherence of pain symptoms. This was accompanied by negative emotions and depression. On the other hand, depression was predicted by lower external but higher internal control over experienced pain. This was also connected with the disruption of daily activities as a result of pain (interference) and anxiety.

The analysis of our results pointed out that the presence of anxiety or depression was associated with dissimilar beliefs. Anxiety positively correlated with other beliefs about negative consequences of pain, poor understanding of pain, and negative emotions (an emotional representation of the disease), whereas depression was affected by patients' inability to control pain. The situation of prolonged stress, further exacerbated by ineffective strategies of coping with pain, accelerated a vicious circle of nonadaptive beliefs, anxiety, and depression.

Internal health locus of control in patients waiting for surgical spine treatment, who are in a situation of prolonged pain, brings benefits associated with an active attitude to treatment, although it might also have some negative consequences. In our study the internal health locus of control was associated with more severe depressive symptoms. Buckelew et al. (1990) found likewise, that patients with an internal locus of control are more likely to seek information, but, on the other hand, they are more apt to blame themselves for their health condition.

In our study, higher external locus of control was associated with less severe depressive symptoms. Growing helplessness and inefficiency of one's own actions might exacerbate depressive symptoms. Patients who feel that other people can influence or control their health condition also express a great deal of trust and hope in the medical staff's relieving actions. There have been clear reports of higher external locus of control in patients experiencing pain along the course of treatment compared with patients still awaiting treatment (Oliveira et al., 2012).

Data from our research allow an exploration of the relationships of five groups of beliefs about pain with the presence of anxiety and depression. The results indicate that anxiety and depression in our patients often coexisted but were derived from dissimilar beliefs. This may be an inspiration for further exploration and research into this problem. The results also highlighted the usefulness of advising about the disease and treatment in comprehensive care for patients with chronic back pain. An indication therefore exists for therapeutic actions targeted at anxiety and depression—for example, through cognitive therapy based on Leventhal's model (McAndrew et al., 2008). Finally, our research provides a more detailed clinical picture of patients with back pain who are qualified for surgery, which creates a better opportunity for exploring patients' perceptions about illness. Psychological consequences of these perceptions are important for coping with illness, and thus influence overall outcome.

The presence of anxiety and depression during conservative treatment or before surgery has been noted in other studies (George & Beneciuk, 2015; Løchting et al., 2017). The results of those studies point to a role of depression and anxiety in the development of disability. This process is enabled through a mechanism of fearful and catastrophic interpretation of symptoms of pain, depression, and activity avoidance (Kayhan et al., 2016; Seekatz et al., 2016).

Our results not only confirm the presence of anxiety and depression in patients with chronic back pain waiting for surgery but also enable predictions about anxiety and depression. Our research has found that there are different psychological mechanisms underlying anxiety and depression, thus pointing to potential ways of treatment. The most basic form of influencing illness perceptions is psychoeducation, which a physician or a nurse may apply while discussing the course of treatment with the patient (Louw et al., 2015). This direction is in line with other research (Marshall, Schabrun, & Knox, 2017). More complex forms of cognitive behavioral therapy are also highly regarded for eliminating anxiety and depression and facilitating physical activity in patients with back pain (Nijs et al., 2014). Some authors also suggest biofeedback (Sielski, Rief, & Glombiewski, 2017).

Limitations

One limitation of the study is lack of detailed data concerning methods of nonoperative pain control. The use of specific pain medication, nerve blocks, or physical therapies might have influenced perceived control over pain. Furthermore, we did not collect data regarding the patients' depression and anxiety after surgery. Exploring potential predictors of long-term outcomes of anxiety and depression is an important direction in future research. Another potential drawback is the lack homogeneity in the group in terms of the type of surgery performed. The type of underlying spinal pathologic conditions might have had an impact on our results. Nevertheless, the studied group was homogenous in terms of the presence of chronic, debilitating back pain, which we believe is the central health problem of the studied group. Further research is needed to establish a link between illness perceptions, anxiety, depression, and the type of spinal surgery performed. Future research is also needed to examine and compare symptoms of depression and anxiety in two groups: surgical and nonsurgical treatment.

Conclusions

Our results contribute to a growing body of evidence concerning the role of psychological factors in chronic back pain. They point to the importance of fast correction of dysfunctional beliefs and illness perceptions and to physical mobilization of patients with chronic back pain. What seems to be of utter importance is the prevention of anxiety and depression in the first stages of acute or subacute pain. A potential for preventing suicidal behavior by addressing invalid illness perceptions is also significant.

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